## Claims

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- A product comprising a polynucleotide sequence encoding a toxin or prodrug-converting enzyme and a polynucleotide sequence encoding a stress response protein or an inducer of stress response protein expression.
- 2. The product of claim 1, for use in enhancing an immune response.
- 3. The product of either of claims 1 or 2 wherein the immune response enhanced is an anti-tumour response.
  - 4. The product of any of claims 1 to 3 wherein the polynucleotide sequence encoding a toxin or prodrug-converting enzyme capable of inducing necrotic cell death and the polynucleotide sequence encoding a stress response protein or an inducer of stress response protein expression are both components of single polynucleotide molecule.
- 5. The product of any of claims 1 to 4 wherein the toxin or prodrug-converting enzyme is a nitroreductase capable of activating the prodrug CB1954.
  - 6. The product of any of claims 1 to 4 wherein the toxin or prodrug-converting enzyme is a cytochrome P450.
- 7. The product of claim 5 wherein the cytochrome P450 is selected from the list consisting of human CYP1A2, human CYP2E1, human CYP3A4, rodent CYP1A2, rodent CYP2E1 and rodent CYP3A4.
- 8. The product of any of claims 1 to 7 wherein the stress response protein encoded or induced is a heat shock protein.

9. The product of claim 8 wherein the heat shock protein is selected from the list consisting of Hsp70, Hsp90, Hsp110, calreticulin, gp96, grp170, Hsp27, Hsc70, *Mycobacterium* Hsp65, *Legionella pneumophila* Hsp60, *Escherichia coli* GroEL and GroES.

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- 10. The product of claim 9 wherein the heat shock protein is Hsp70.
- 11. A DNA vaccine comprising the product of any of claims 1–10.
- 10 12.A DNA vaccine comprising a polynucleotide encoding a toxin or prodrugconverting enzyme for enhancing an anti-tumour immune response.
  - 13. The DNA vaccine of claim 12 wherein the toxin or prodrug-converting enzyme is a nitroreductase capable of activating the prodrug CB1954.

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- 14. The DNA vaccine of claim 13 wherein the toxin or prodrug-converting enzyme is a cytochrome P450.
- 15. The DNA vaccine of claim 14 wherein the cytochrome P450 is selected from the list consisting of human CYP1A2, human CYP2E1, human CYP3A4, rodent CYP1A2, rodent CYP2E1 and rodent CYP3A4
  - 16.A product comprising a polynucleotide encoding a nitroreductase capable of activating the prodrug CB1954 and a polynucleotide encoding an immunostimulatory molecule, for use in enhancing an anti-tumour immune response.
  - 17.A product comprising a polynucleotide encoding a cytochrome P450 and a polynucleotide encoding an immunostimulatory molecule, for use in enhancing an anti-tumour immune response.

- 18. The product of either of claims 16 or 17 wherein the immunostimulatory molecule is selected from the list consisting of GM-CSF, IL-1, IL-2, IL-4, IL-6, IL-10, IL-12, IL-18, B7-2, TNFα, γ-IFN, MCP-1, MIP-2, RANTES, TGF-β, CD154, CD134 ligand, MHC Class I, MHC Class II, CD135 ligand and TRAIL.
- 19. A vector encoding and allowing expression of
  - a) a toxin or prodrug-converting enzyme and
  - b) a stress response protein,

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- for use in enhancing an immune response.
  - 20. The vector of claim 19 wherein the immune response is an anti-tumour response.
- 15 21. The vector of either of claims 19 or 20 wherein the stress response protein is a heat shock protein.
  - 22. The vector of claim 21 wherein the heat shock protein is selected from the list consisting of Hsp70, Hsp90, Hsp110, calreticulin, gp96, grp170, Hsp27, Hsc70, *Mycobacterium* Hsp65, *Legionella pneumophila* Hsp60, *Escherichia coli* GroEL and GroES.
    - 23. The vector of claim 22 wherein the heat shock protein is hsp70.
- 24. The vector of any of claims 19 to 23 wherein the toxin or prodrugconverting enzyme is a nitroreductase capable of activating the prodrug CB1954.
- 25. The vector of any of claims 19 to 23 wherein the toxin or prodrugconverting enzyme is a cytochrome P450.

- 26. The vector of claim 25 wherein the cytochrome P450 is selected from the list consisting of human CYP1A2, human CYP2E1, human CYP3A4, rodent CYP1A2, rodent CYP2E1 and rodent CYP3A4.
- 27. The vector of any of claims 19 to 26 wherein one or both of the polynucleotide sequences encoding of the toxin or prodrug-converting enzyme on the one hand, and the stress response protein or inducer of stress protein expression on the other, operably linked to one or more promoters providing tumour-selective expression.

28. The vector of claim 27 wherein the promoter comprises one or more TCF-responsive elements.

- 29. The vector of any of claims 19 to 29 wherein the vector is a viral vector.
- 30. The vector of claim 29 wherein the vector is an adenoviral vector.
- 31. The vector of claim 29 wherein the vector is a retroviral vector.
- 32. The vector of claim 31 wherein the vector is a lentiviral vector.
  - 33. An adenoviral vector encoding and allowing expression of
    - a) a nitroreductase capable of activating the prodrug CB1954 and
    - b) hsp70

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- for use in enhancing an anti-tumour immune response.
  - 34.A host cell comprising the vector of any of claims 19 to 33.
- 35. A vaccine comprising the product of any of claims 1 to 10, or 16 to 18, the vector of any of claims 19 to 33, or the host cell of claim 34.
  - 36. The product of any of claims 1 to 10, or 16 to 18, the DNA vaccine of any of claims 10 to 15, the vector of any of claims 19 to 33, or the host cell of claim 34 for use as a medicament.

- 37. The product of any of claims 1 to 10, or 16 to 18, the vector of any of claims 19 to 33, or the host cell of claim 34 for use as a vaccine.
- 5 38.A pharmaceutical composition comprising composition of any of claims 1 to 10, or 16 to 18, the DNA vaccine of any of claims 10 to 15, the vector of any of claims 19 to 33, or the host cell of claim 34 together with a pharmaceutically-acceptable diluent, buffer, adjuvant or excipient.
- 39. Use of the product of any of claims 1 to 10, or 16 to 18, the DNA vaccine of any of claims 10 to 15, the vector of any of claims 19 to 33, or the host cell of claim 34 for the manufacture of a medicament for the treatment of cancer.
- 40. Use of the product of any of claims 1 to 10, or 16 to 18, the DNA vaccine of any of claims 10 to 15, the vector of any of claims 19 to 33, or the host cell of claim 23 for the manufacture of a vaccine for the treatment of cancer.
- 41.A method of enhancing an immune response, comprising administering a therapeutic amount of a product comprising a polynucleotide encoding a toxin or prodrug-converting enzyme and a polynucleotide encoding a heat shock protein or an inducer of heat shock protein expression.
- 42. The method of claim 41, wherein the immune response is an anti-tumour immune response.
- 43. A method of treating a human suffering from a form of cancer, comprising administering a therapeutic amount of a product comprising a
  polynucleotide encoding a toxin or prodrug-converting enzyme and a polynucleotide encoding a heat shock protein or an inducer of heat shock protein expression.

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- 44. The method of any of claims 41 to 43, comprising
  - a) administering a therapeutic amount of a product comprising a
    polynucleotide encoding a nitroreductase capable of activating the
    prodrug CB1954 and a polynucleotide encoding a heat shock protein,
  - allowing a period of time during which the product enters tumour cells and the encoded nitroreductase and heat shock protein are expressed, and
  - c) administering a therapeutic amount of CB1954.
- 45. The method of any of claims 40 to 42, comprising

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- a) administering a therapeutic amount of a product comprising a
  polynucleotide encoding a cytochrome P450 and a polynucleotide
  encoding a heat shock protein,
- allowing a period of time during which the product enters tumour cells and the encoded cytochrome P450 and heat shock protein are expressed, and
- c) administering a therapeutic amount of a prodrug.
- 46. The method of claim 43 wherein the prodrug is acetaminophen
- 47. The method of any of claims 40 to 44 wherein the heat shock protein is Hsp70.
- 48. A method of treating a human suffering from a form of cancer, comprising administering a therapeutic amount of a product comprising a polynucleotide encoding a heat shock protein, and a therapeutic amount of anti-cancer cytotoxic drug, such that a therapeutic anti-tumour immune response is induced.

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- 49. A method of eliciting an anti-tumour immune response comprising
  - a) administering a therapeutic amount of a product comprising a polynucleotide encoding a nitroreductase capable of activating the prodrug CB1954,
- allowing a period of time during which the composition enters tumour cells and the encoded nitroreductase is expressed, and
  - c) administering a therapeutic amount of CB1954.